

NOTES ON THE BEHAVIOR AND HABITS OF STIGMATOMMA PALLIPES HALDEMAN

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It has so happened that in the course of the past several years the writer has chanced to be enabled to observe rather closely the Ponerine ant, *Stigmatomma pallipes* (Tribe Amblyoponi), both under natural conditions and in the artificial nest. During this time a few notes of behavior have accumulated which have been of personal interest, either because they indicated traits eminently primitive or degenerate, or, in some cases, startlingly plastic for so ancient a form. None of these notes can possibly be more than corroborations of the statements of others, but the hope that as such they might be of some interest to those concerned with the ant has induced me to bring a few of them together in condensed form.

NESTING HABITS AND THE FORMATION OF NEW COLONIES

The communities, ranging in number from two to rarely more than sixty individuals, are ordinarily found in thick, damp woodlands, the typical localities in which most timid hypogeaic forms find refuge. Although the majority of these forms seem dependent for their continued existence upon these forests, with their concomitant opportunity of escape from more dominant types, it is certain that *pallipes* has not become entirely so, nor has it completely lost the ability to exist in proximity with glade or even field forms. In Petersham, Massachusetts, a colony taken under a broad stone in an open clump of young white pine, which was nesting beside two species of open-woods ants (*L. americanus* and *A. picea*), was unusually populous, and so prosperous as to aggressively resent intrusion. A more remarkable illustration of the same fact came to personal observation. A portion of an old, thick and damp forest of mixed coniferous and deciduous growth near Schenectady, N. Y., was cut over in 1915

for the purpose of forming building lots. At that time *pallipes* was the dominant ant of the region, experiencing competition only from a few small and depauperate colonies of ants of the genera *Leptothorax*, *Lasius*, *Myrmica* and *Prenolepis*. Ten years later, *pallipes* was still very abundant in the uncut portion of the land, which had remained unchanged. But the ants were equally abundant in the cut-over area, which had been built upon. Prosperous colonies were found in many flower beds, an unusually splendid one being taken five feet from a house foundation. An adjoining meadow had been transformed to a truck garden, a portion of which, owing to reflection from a concrete surface and a full southern exposure, was exposed to the most brilliant light and almost unbearable heat every cloudless day from ten o'clock onward. Yet here, too, the insects flourished, existing side by side with numerous colonies of *F. subsericea*, *A. claviger*, *L. niger* and *M. rubra*. In the space of ten years numerous colonies of *pallipes* had been suddenly brought from conditions of dense shade and coolness to the full heat and sunlight of open conditions, and the full competition of a field association which lost no time in occupying the ground, and in that time had contrived not only to continue to exist, but to so thoroughly adapt themselves to the new circumstances as to prosper.

The reluctance of the winged females of this Ponerine to emerge for the nuptial flight from an artificial nest caused some doubt for a time as to the existence of such a flight under natural conditions. The question, of course, has been definitely solved. Ample personal evidence of the existence of such a flight has been obtained, which, as it may chance to be of corroborative interest, has been included.

Males are almost always ready to take flight from the artificial nest. Numerous males took flight from personally observed Lubbock nests in 1924, 1925 and 1926. They were usually but three or four days old. A single callow queen emerged from an artificial nest in 1924, but did not take flight. In 1925 four queens, all in the red callow condition, emerged, of which one took flight. Eight others left their nests immediately after having cast the wings.

More conclusive evidence has been obtained from wild colonies. On the afternoon of September 12, 1925, a very hot and humid

day, fourteen males of *Stigmatomma pallipes* were taken from a pool of water in the tract of woodland already mentioned. They had evidently been caught while participating in the flight. A very large proportion was alive. Later a single queen was taken. The insect was, to judge from pigmentation, but two or three days old, and had perished, probably becoming caught on descending. On September 26, 1926, a young winged queen was found sauntering about the top of a stone, from underneath which a typical gallery opened. The ant appeared to be about to take flight, but did not do so, returning after about fifteen minutes in the open. The individual was in the callow condition. On September 4, 1927, three queens, all of which were still living, were taken in some small water dishes standing in the truck garden already mentioned. As they had emerged about noon on a very hot and bright day, the heat and light were such as to be endured for but a few moments at a time, so that the observations are scattered. The three ants were all very active, and when dried and confined to a dark place, exhibited such marked signs of positive phototropism that they were brought again into the sunlight and momentarily released. One individual took flight on three occasions, being in each case struck down. The females remained feverishly active and positively phototropic until late in the afternoon, when they became suddenly photophobic and returned underground.

Little personal evidence has been secured on the procedure followed by the young queens on descending. All isolated individuals, even when regularly fed, have shown no desire to form nests, and have shortly either escaped or perished. On the other hand, young queens remaining with the parent colony have taken part actively in its functions. The large number of queens ordinarily found in a single colony, together with the similarity in stature of the worker and queen, and the rambling type of nest-form observed in the majority of localities, seem to indicate that in most cases new colonies are formed simply by extensions from the parent. The first broods of queens taken from certain localities, however, possess the power to pupate prematurely, as in the cases of those higher ants whose queens form independent communities. A small and apparently isolated colony taken in 1925,

consisting of a young queen, two workers of the normal form, a few small eggs and larvæ, and four tiny cocoons, brought three larvæ to maturity, all of which were hatched from eggs laid in the artificial nest. Between the fifteenth and the twenty-fifth of the following January, these larvæ pupated, although but about one-half the normal size. Larvæ of the same size and age, likewise hatched in artificial nests but belonging to larger colonies, continued to feed and to grow, the first not spinning until June 22. The young ants of the incipient colony, on hatching, were perfect, but exceedingly small, and unusually heavily pigmented, exactly like the first-brood adults of higher ants. The cocoons from which these insects were eclosed were of exactly the size and form of those taken with the colony, they having perished.

LENGTH OF DEVELOPMENTAL PERIODS

The time consumed in the development of the young is unusually long with *pallipes*, and varies widely between individuals, and with conditions of temperature and moisture. The period consumed by the embryo in development has been found fairly uniform, ranging in length from forty to sixty days. When incubated from the time of laying in an atmosphere containing from fifty to seventy-five per cent. of oxygen, eggs have hatched in twenty-seven days. The length of life of the larva is enormously variable, since larvæ are accustomed to hibernate at any stage of growth, and possess the power of remaining inert over long periods, even during warm weather, when food is scarce. The extremes of development which have been observed are 137 and 233 days. The first figure represents the total length of larval life, but the second individual had passed the winter in a nearly mature condition before it was taken, so that the total figure must be nearly double this. The length of pupal life varies almost directly with weather conditions. The observed extremes have been 41 and 57 days, made under very similar conditions of temperature (a mean of about 20° C.). Under more widely variant conditions the figures would doubtless be farther apart. But one personal observation which can be credited as of any value has been made on the length of adult life. The insect in question was hatched in the artificial nest and died,

giving some evidence of actual decease from old age, when between twenty-four and twenty-five months old. This ant had been active during both the intervening winters, which may have tended to shorten its natural span of life, which, however, it is to be supposed must be shorter in any case than that of higher ants. The insect in question was a worker. The winged castes are produced irregularly from July to September in the New England States and northern New York, the observed extremes being July 27 (queen) and September 23 (queens and males).

RELATIONSHIPS BETWEEN ADULTS, AND ADULTS AND BROOD- NESTING HABITS

Regurgitation has never been personally observed, nor, I believe, recorded between adults of *pallipes*, thus removing one of the strongest bonds between the adults of the colony. Individuals are frequently licked, as among the higher ants. The primitive root from which the habit of deportation seems to have developed is to be observed. The deported individual is grasped by the first gastric segment, or by any portion of the head, and uncertainly dragged for a distance, being handled in the awkward fashion characteristic of the ant when moving cocoons. This "deportation" is rarely practiced when danger is threatened, but may be at any other time. Frequently individuals have been observed to drag others which were feeding upon an insect newly brought in away from the food. This procedure was followed for several minutes by a dozen individuals on one occasion, thirteen separate cases being observed inside of two minutes.

The adults are very solicitous of the eggs, licking them and carrying them about with great frequency. As in higher ants, trophallaxis forms the bond between adults and larvæ, but no larva has been observed to be fed with liquid food. *Pallipes* has been seen to pinch larvæ to assist in the exudation of fluids—no doubt the remnant of a primitive Vespine trick. Larvæ quickly devour dead members of the brood, but no larva has been observed to actually kill another, or to devour ova. Young larvæ have occasionally been accidentally impaled on the sharp mandibles of the adults, indicating a significant lack of care on the part of the nurses in their handling of the young.

Little has been observed concerning the nature of the provender brought into the brood chamber by foraging adults. In a single instance, portions of some Myriopod were found distributed among the larvæ of a wild colony, but the animal had been too long exposed to the ravages of the young ants to be identified. In captivity, any Articulate has been taken readily by the most enterprising colonies, although the more timid often confined themselves to the pupæ of higher ants. Although both adults and young when under natural conditions are wholly entomophagous, the former have taken fruit quite readily, but have never offered it to the larvæ. Honey is not recognized as edible by adult females, but is greedily devoured by males—perhaps another ancient habit derived from Vespine stock.

The integrity of colonies is well preserved with *pallipes*, alien ants being quickly detected and attacked. This is more strictly true with isolated colonies of compact type than among those in which the rambling galleries apparently extend for considerable distances. As among the higher ants, the recognition seems due to a definite odor constant for a colony, but a marked individual odor has also been found to have been present in a number of tested ants. The characteristic odor appears when the ant is but a few hours old, and is well developed within forty-eight hours.

Nests have been found excavated in rotten wood, and in coarse sand, clay loam, and almost pure colloidal yellow clay, marked preference being shown for the last-named medium. No evidence of accessory structures, of course, has been seen at any time.